



2005

A large, stylized gear or cogwheel graphic, rendered in a golden-yellow color, positioned on the left side of the cover. The gear has a complex, multi-toothed design.

Partnership Update

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2005 PARTNERSHIP UPDATE

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For additional information about the CHP Partnership, its accomplishments, tools, and services, please visit www.epa.gov/chp or contact:

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EPA's CHP Partnership

The U.S. Environmental Protection Agency (EPA) is pleased to present its first annual Combined Heat and Power (CHP) Partnership Update.

2005 was an active year for the CHP Partnership! The Partnership now consists of 177 Partners, including energy users, energy service companies, CHP project developers and consultants, equipment manufacturers, as well as federal, state, and local government agencies. The Partnership has been actively working with stakeholders to support CHP project development and get the word out about CHP's energy efficiency, economic, and environmental benefits. A significant reduction of greenhouse gas emissions can be attributed to the Partnership through this work:

Through 2005, CHP Partners installed 3,460 megawatts (MW) of CHP with Partnership assistance. The resulting emission reductions are equivalent to:



Annual emissions of more than 1.6 million automobiles

OR



Planting more than 2.5 million acres of trees

In addition to providing direct project assistance and education and outreach, the Partnership enthusiastically encourages public recognition of outstanding CHP projects. This year, the Partnership presented more than 25 ENERGY STAR CHP Awards and CHP Certificates of Recognition at key events throughout the country—rewarding efficient CHP projects that demonstrate leadership in environmental performance.

What Is the EPA CHP Partnership?

Power generation in the United States contributes to the emissions of air pollutants and greenhouse gases. As power generation increases to meet increased demand, so will emissions. While average power plant fuel conversion efficiency is around 33 percent, CHP (also called cogeneration) provides an opportunity to improve that efficiency and meet demand with less fuel and reduced emissions per unit of power generated.

EPA established the CHP Partnership in an effort to publicize the potential energy, environmental, and economic benefits of using CHP to meet a greater portion of our nation's growing energy demand.

Through the CHP Partnership, EPA offers a number of tools and services that are designed to increase the deployment of CHP. The CHP Partnership:

- Provides technical, economic, and regulatory assistance for proposed projects.

- Maintains a current list of state and federal CHP and biomass incentives, including grants, tax incentives, regulatory treatment, and utility rates favorable to clean distributed generation projects.
- Facilitates Partner marketing and networking.
- Provides guidance and tools to help energy users become educated CHP champions.
- Promotes the environmental benefits of CHP through the ENERGY STAR CHP Awards, CHP Certificates of Recognition, the CHP Emissions Calculator, and Partner Greenhouse Gas Reduction Reports.
- Engages in strategic market analysis and development.
- Informs state and federal policy makers on best practices to promote the development of clean energy.

The EPA CHP Partnership is open to industry, institutions, energy users, and state, local, and tribal governments interested in developing CHP projects and/or promoting the benefits of CHP. If you are interested in joining, please visit www.epa.gov/chp.

ENERGY STAR CHP Awards & Certificates

EPA and the U.S. Department of Energy (DOE) recognize highly efficient CHP projects that achieve significant fuel and emission savings over comparable state-of-the-art separate heat and power. Projects can receive either or both the ENERGY STAR CHP Award and the CHP Certificate of Recognition. **If your project is substantially thermally baseloaded (i.e., utilizes most of the heat produced by the CHP system), it is a good candidate for an ENERGY STAR CHP Award!**

Award Types

The ENERGY STAR CHP Award recognizes projects that reduce emissions and use at least 5 percent less fuel than state-of-the-art comparable separate heat and power generation.

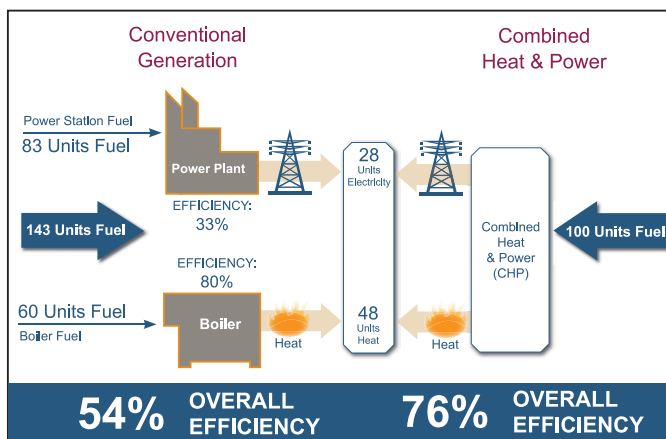
The EPA CHP Certificate of Recognition recognizes efficient CHP projects that demonstrate leadership in environmental performance without achieving all the ENERGY STAR CHP Award criteria.

When a project is selected for an Award or Certificate, EPA sends a letter to the recipients and develops an announcement highlighting the project's energy and environmental excellence. The Award or Certificate is then announced on EPA's Web site. In addition, the Partnership presents a plaque to the Award or Certificate winners at a key event agreed upon by both the winners and EPA.

How Fuel Efficiency is Compared

To qualify for an ENERGY STAR CHP Award, a CHP project must use at least 5 percent less fuel than the state-of-the-art separate heat and power system against which it is compared. This comparison is performed against separate heat and power generation (e.g., an onsite boiler and grid electricity) that uses a comparable fuel, the same power-to-heat ratio, and incorporates transmission and distribution (T&D) losses.

For example, a natural gas-fueled CHP system would be compared to a natural gas combined cycle electric-only plant and a natural gas-fueled boiler; adjustments are made for T&D losses if the CHP project sells power to the grid.



The Application Process

Applying for the Award or Certificate is fairly simple, and the Partnership will help facilitate the process as needed. For information or assistance with the application, please contact Tom Frankiewicz at frankiewicz.thomas@epa.gov.

Complete the electronic application at www.epa.gov/chp/awards/how_to_apply.htm. EPA accepts applications continuously throughout the year.

To qualify for an ENERGY STAR CHP Award, a project must:

- Be in commercial operation.
- Be operating within the emission limits stipulated in their permits.
- Have a minimum of 12 months and 5,000 hours of measured operating data. Because Awards and Certificates recognize contemporary performance, the operating period covered by the submitted data must begin within 14 months prior to the date of application.
- Use at least 5 percent less fuel than comparable state-of-the-art separate heat and power generation.

To qualify for a CHP Certificate of Recognition, a project must:

- Be in commercial operation.
- Be operating within the emission limits stipulated in their permits.
- Demonstrate emerging technologies, fuel diversity, or new markets for environmentally beneficial CHP.

There is no requirement for a minimum operating period or a minimum number of operational hours, but data submitted must be contemporary (for a period within the 14 months preceding the application).

ENERGY STAR is a government-backed program helping businesses and individuals protect the environment through superior energy efficiency. For more information on ENERGY STAR, visit www.energystar.gov

ENERGY STAR CHP Awards & Certificates



2005 ENERGY STAR CHP Award and CHP Certificate of Recognition Winners

EPA and DOE were pleased to present 15 ENERGY STAR CHP Awards and 13 CHP Certificates of Recognition in 2005. Congratulations again to all of our award-winning Partners for using CHP to increase efficiency, reduce fuel use, and achieve significant emission reduction benefits compared to separate heat and power!

2005 ENERGY STAR CHP AWARD WINNERS

Arrow Linen Supply Company (NY)

Produces 300 kW of electricity with an operating efficiency of 82%, requiring 36% less fuel and reducing CO₂ emissions by 650 tons per year.

Greenpark Care Center; American DG New York, LLC (NY)

Produces 140 kW of electricity, operating at 76% efficiency and using 27% less fuel, which reduces CO₂ emissions by 530 tons per year.

Hermans Farms Dairy; American DG New York, LLC (NY)

Produces 210 kW of electricity and requires 21% less natural gas, operating at an efficiency of 59% and avoiding 660 tons of CO₂ emissions per year.

Hexion Specialty Chemicals, Inc. (NY)

Produces 451 kW of electricity from process waste heat, resulting in CO₂ emissions reductions of 8,300 tons per year.

Middlebury College (VT)

Produces 1.8 MW of electricity operating at 81% efficiency; using 6% less fuel, reduces CO₂ emissions by 1,200 tons per year.

Mohegan Sun (CT)

Produces 400 kW of electricity, operating at 58% efficiency and requiring 26% less fuel, eliminating emissions of 1,460 tons of CO₂ per year.

Rego Park Nursing Home; AES-NJ Cogen Co. Inc. (NY)

Produces 70 kW of electricity with an operating efficiency of 81%, using 32% less fuel, and reducing CO₂ emissions by 330 tons per year.

St. Francis Hospital and Medical Center (CT)

Produces 200 kW of electricity with a 57% operating efficiency, reducing fuel consumption by 25% and CO₂ emissions by 690 tons per year.

Sea Rise I; Bay Park I Associates (NY)

Produces 110 kW of electricity, operating at 85% efficiency and reducing fuel consumption by 39% while eliminating 630 tons per year of CO₂.

Sea Rise II; Bay Park II Associates (NY)

Produces 110 kW of electricity, operating at 84% efficiency and reducing fuel consumption by 35% while reducing CO₂ emissions by 570 tons per year.

South Houston Green Power 2; Cinergy Solutions, Inc., and BP Global Power (TX)

Produces 564 MW of electricity and 3.1 million pounds of steam per hour, operating at 78% efficiency and using 33 percent less fuel; reduces CO₂ emissions by 1.94 million tons per year.

University of Maryland, College Park (MD)

Produces 27.3 MW of electricity, operating at 68% efficiency and reducing fuel use by 16%, thus avoiding the emission of 53,000 tons of CO₂ annually.

University of Texas at Austin (TX)

Produces 61 MW of electricity, 280,000 lb/hr of steam, and 150,000 lb/hr of boiler feedwater with an operating efficiency of 60%; uses 24% less fuel and results in 136,000 tons fewer CO₂ emissions per year.

Weyerhaeuser Albany Containerboard Mill (OR)

Produces 93 MW of electricity and operates at 70% efficiency, reducing fuel consumption by 17% and by 379,000 tons of CO₂ emissions per year.

Weyerhaeuser Hawesville Complex (KY)

Produces 88 MW of electricity and 1 million pounds of steam per hour, while operating at 86% efficiency; reduces fuel consumption by 23% and annual CO₂ emissions by 267,000 tons.

2005 CHP CERTIFICATE OF RECOGNITION WINNERS

4C Foods CHP Project (NY)

10 West 66th Street Corporation CHP Project (NY)

30 North LaSalle CHP Project; Equity Office Properties (IL)

Beaumont Refinery CHP Project; ExxonMobil Corporation (TX)

Federal Research Center—White Oak Central Utility Plant CHP Project; General Services Administration (MD)

Holliswood Care CHP Project; American DG New York, LLC (NY)

La Jolla Medical Center CHP Project; Department of Veterans Affairs (CA)

Manchester Tank CHP Project; NiSource Energy Technologies (IN)

South Windsor High School CHP Project (CT)

University of Cincinnati CHP Project (OH)

Utilimaster CHP Project; NiSource Energy Technologies (IN)

Vestil Manufacturing CHP Project; NiSource Energy Technologies (IN)

Waldbaums Supermarket CHP Project; A&P Tea Company (NY)



2005 ENERGY STAR® AWARD COMBINED HEAT AND POWER

Presented to

Your Company Here

By the United States Environmental Protection Agency and
the United States Department of Energy in recognition of the
significant pollution reduction and energy efficiency qualities
of the xxxxxx CHP project.

Awarded on xxxx

Kathleen Hogan
Director, Climate Protection Partnerships Division
U.S. Environmental Protection Agency

Strategic Market Development

As part of its broader outreach and education efforts to expand knowledge of the benefits and applications of CHP, the Partnership is undertaking targeted efforts to increase CHP use in three specific market sectors: dry mill ethanol production, hotels/casinos, and wastewater treatment. The Partnership's work in these sectors is intended to serve two main audiences: energy users and industry Partners. The Partnership provides energy users with sector-specific information on the technical and economic benefits of CHP so they can consider its application at their own facilities. The Partnership provides its market analysis, which informs these outreach efforts, to our CHP industry Partners to help increase their penetration into these sectors. The Partnership's work in these strategic markets includes:

- Evaluating the technical fit for CHP within the market sector.
- Conducting market-specific research.
- Performing outreach to sector stakeholders, including energy users, sector associations, and relevant state agencies.
- Providing project assistance to promote the installation of CHP in the sector.

The Partnership has found common elements in each of the three markets it has examined:

- CHP is a strong technical fit for many facilities within the sector.
- CHP is commercially available and has been proven effective in application.
- CHP can be a compelling investment depending on local electricity prices and fuel costs.
- CHP offers additional values and benefits, including offset equipment costs, increased reliability, and emission reductions.
- CHP has been underutilized in the market to date.

Key highlights of findings and opportunities in each of the sectors are presented below. Presenting summary financial information for these projects is difficult, however, because each project has unique benefits and costs that must be assessed based on site-specific factors. The CHP Partnership can share ideas or provide assistance in determining the financial success of a particular CHP project in these markets. In addition, if you are interested in learning more about EPA's findings in these markets or have any market intelligence or suggestions to share with EPA, please contact Kim Crossman at crossman.kim@epa.gov.

Dry Mill Ethanol Production

The Market. Dry mill ethanol production is the most common method for producing ethanol by fermenting dried ground corn to convert the starch protein to ethanol. Dry mill ethanol plants are an excellent fit for CHP. They have large and relatively constant power and steam demands, and they operate 24 hours a day, 365 days a year. **The size of the electricity and steam loads at ethanol plants closely matches the size of commonly available CHP technologies.** Energy represents a large portion of dry mill ethanol production costs, second only to the cost of the corn used as the feedstock. Despite CHP's excellent fit, adoption in this industry has been slow. Currently, only five of approximately 80 operating U.S. dry mill ethanol facilities incorporate CHP into their operations.

Currently, 95 ethanol plants are operating in the United States, with 40 new plants or expansions under construction and many more proposed. The industry produced 3.4 billion gallons of ethanol in 2004, and the Renewable Fuels Standard will help provide a market for nearly 8 billion gallons by 2012. The industry is expected to invest an estimated \$6 billion to build 4.3 billion gallons of new ethanol capacity by 2012 to meet this growing demand.

As the market adjusts to meet this projected growth, the size and location of new dry mill ethanol plants are changing—from the current typical profile of 15 million to 50 million gallon per year (mmgy) plants located in the Midwest to new 100 mmgy plants sited not only in the Midwest, but also in the Northeast and California, where ethanol demand is concentrated. These market shifts and available financial incentives are making CHP an economical choice for new facility construction and fuel production.

Technical Fit. Current dry mill ethanol plants typically have production capacities ranging from 15 to 50 mmgy. Power demand ranges from 2 to 6 MW and typical steam use is 40,000 to 150,000 lb/hr. A variety of CHP system options are available for dry mill ethanol facilities, including gas turbines with and without supplemental firing and boiler/steam turbine systems. In addition to these more traditional applications, bio-mass-fueled systems are being considered that use distillers dried grains with solubles (DDGS—a byproduct of the ethanol production process) or agricultural or forest waste fuels.

Integrated volatile organic chemical (VOC) destruction can provide a low-cost solution for reducing VOC emissions from distilled grain solids dryers and increase the benefit of CHP. Options for integrating VOC destruction into a CHP system

Strategic Market Development

include producing power with steam recovered from conventional thermal oxidizers or incorporating VOC destruction in gas turbine or boiler/steam turbine systems.

Strategic Issues. Challenges to implementing CHP at ethanol plants include the ethanol production industry's general unfamiliarity with CHP; concerns about cost (e.g., lack of capital, rising natural gas prices); and questions about permitting. In response, the Partnership is working to raise awareness of the benefits of CHP and the successful track record of CHP technologies within the industry and in similar production processes.

Some ethanol developers have expressed concerns that adding CHP to their projects will slow down their fast-tracked project schedules by complicating the permitting process or by pushing the facility past the Major Source threshold. The

Partnership has engaged ethanol developers, ethanol proponents, and the air permitting community to increase their knowledge of CHP technologies and emissions, and encourage them to consider CHP earlier in the planning process as a best practice to reduce costs and improve the lifecycle environmental performance of ethanol.

Key Stakeholders. The Partnership has conducted a variety of outreach and support activities to engage critical stakeholders in the ethanol industry, including project developers, facility owners, equipment manufacturers, engineering firms, state energy offices, state economic development offices, state environmental offices, ethanol industry associations, the Governors' Ethanol Coalition, the U.S. Department of Agriculture, DOE, and the Midwest CHP Application Center.

Hotels/Casinos

The Market. Hotels and casinos represent an excellent, but underutilized market for CHP. The Partnership recently completed a market study that verified the significant market potential for CHP in the hotel and casino market, particularly in larger, full-service facilities. **While there are nearly 48,000 hotels in the United States, about 10,000 of them have the energy characteristics suitable for current CHP technology.**

The hotel industry is currently in an upswing. However, while revenues are increasing, costs are rising as well. Energy represents one of the few cost elements within a hotel's control.

The Partnership has chosen at this time to focus actively on two specific industry segments—100- to 500-room hotels located in areas of the United States that are favorable to CHP and large casinos and resort hotels (see following text box).

Ninety-eight hotels in the United States currently have CHP systems, representing over 63 MW of capacity. California has the most CHP-equipped hotels in the country by a large margin, with New Jersey and New York second and third. Of the existing CHP systems in the hotel/casino sector, the majority are reciprocating engine systems. Many of these systems were installed during the late 1980s. Over the past few years, however, the mix of technologies used for CHP has broadened to include microturbine, fuel cell, and gas turbine installations.

Technical Fit. Three-quarters of the total energy needs for the hotel industry are dictated by space heating, water heating, air conditioning, and lighting—all of which can be met by an appropriately designed CHP system. Given typical load profiles, hotels on average need at least 100 rooms to support an economically viable CHP system. Hotels in the 100 to 200 room category can utilize a 60 to 120 kW CHP system based on

reciprocating engines or microturbines supplying hot water for domestic hot water, space heating, and laundry needs. Larger hotels can utilize larger CHP systems and incorporate absorption chillers to enhance thermal energy recovery and meet air

Market Differentiation

Mid-Size to Large Hotels. Hotels with 100 to 500 rooms offer solid opportunities for incorporating standard CHP systems. They also represent the most accessible opportunities; about 70 percent of all motel and hotel rooms are associated with franchises and national chains. The largest 15 hotel corporations (representing 22,708 hotels) own more than 2.7 million available rooms in the United States. These large corporations can provide centralized decisionmaking for CHP project development or provide a centralized channel for outreach activities to franchised operations.

Resort Casinos. Large resort hotels and casinos occupy millions of square feet of building space, and their energy use intensity per square foot is much higher than that of a typical business hotel. In addition, they face different design complexities and drivers compared to more standard hotel applications. For example, constant ventilation and cooling loads provide opportunities for larger CHP systems with absorption cooling. Because most casinos allow smoking on the casino floor, indoor air quality and equipment performance must be considered when engineering a design. In addition, concerns about power reliability are prevalent within this sector due to the risk of catastrophic loss of gaming revenues. In Las Vegas, a trend towards large mixed-use casino/commercial/condominium developments might provide opportunities for district energy applications of CHP.

Strategic Market Development

conditioning needs. Large resort/casino complexes can support multi-megawatt systems based on large reciprocating engines or gas turbines.

Strategic Issues. The top national chains account for the majority of hotel development either through new construction or by acquiring existing facilities. Growth data for the five top chains in the United States showed over 165,000 rooms under development in 2004—85 percent of which is new construction. New construction, therefore, represents one of the best

opportunities for making a CHP decision under current market conditions, although renovations also represent an opportunity for facility upgrades.

Key Stakeholders. The Partnership will be developing its market strategy for the hotel/casino market over the next several months. Key to this strategy will be the involvement of stakeholders, such as hotel owners, hotel management organizations, and the design and engineering community that services these markets.

Wastewater Treatment

The Market. CHP is a reliable, cost-effective option for wastewater treatment facilities that have, or are planning to install, anaerobic digesters. **The biogas flow from the digester is used as “free” fuel to generate electricity and power in a CHP system using a turbine, microturbine, fuel cell, or reciprocating engine.** CHP offers many benefits for wastewater treatment facilities because it:

- Produces power at a cost below retail electricity.
- Displaces purchased fuels for thermal needs.
- Qualifies as a renewable fuel for green power programs.
- Enhances power reliability for the plant.
- Offers an opportunity to reduce greenhouse gas and other air emissions.

Wastewater treatment facilities are vulnerable to catastrophic events, natural disasters, and other emergencies. Because they provide critical infrastructure for maintaining public health and the environment, they must operate under any of these conditions. The use of CHP as prime power source or as backup can provide critical off-grid reliability to enable wastewater treatment plants to continue operations in the event of a utility failure. Furthermore, in the face of tightening local budgets, cost savings resulting from CHP operations can be redirected to other preparedness or infrastructure priorities.

Currently wastewater treatment CHP systems are in place in 23 states, representing 176 MW of capacity. California and Oregon have the largest number of facilities.

Technical Fit. Biogas is a by-product of the anaerobic decomposition of sludge at wastewater treatment facilities. With a CHP system, a biogas flow rate of 300 standard cubic feet per minute

(scfm) can produce approximately 800 kilowatts (kW) of electricity along with more than 2.5 million British thermal units per hour (MMBtu/hr) of thermal energy, which can be used for anaerobic digester and space heating loads at the facility.

In states where electricity prices are low, using biogas directly in boilers may be the best investment for a wastewater treatment facility. Each wastewater treatment facility considering CHP will need to perform its own site-specific feasibility analysis to determine potential biogas generation rates; methods to compress, clean, and dry the biogas before combustion; and the costs and benefits of generating onsite heat and electricity.

Strategic Issues. Biogas capture and use at landfill gas sites have been explored for their potential eligibility for renewable fuel credits and clean energy funding. The eligibility of the similar use of biogas from anaerobic digestion at wastewater treatment facilities is emerging as a possible opportunity to claim credits or garner additional funding for projects. The Partnership is exploring these possibilities and would welcome Partners' insight or input into the feasibility of such options.

In addition, some states offer financial incentives (e.g., grants, rebates) for the production of clean onsite generation—such as biogas-fueled CHP—that reduces peak period electricity demand. See the Partner Resources section of the Partnership Web site at: www.epa.gov/chp/funding_opps.htm for an up-to-date list of states that provides such incentives.

Key Stakeholders. The Partnership is collaborating with EPA's Office of Wastewater in the Office of Water, ENERGY STAR's Wastewater Treatment Facility efficiency effort, the National Association of Clean Water Agencies (NACWA), the Water Environment Research Foundation (WERF), New York State Energy Research and Development Authority (NYSERDA), and DOE's Regional Application Centers.

Partner Accomplishments

CHP Partners provide reports to EPA annually about projects in which they are involved that are operational or in development. Data reported by Partners through December 15, 2005 show that EPA's CHP Partners were responsible for at least 70 percent of all CHP installations in the United States from 2001 through 2005 (Figure 1). In addition, CHP Partners were responsible for at least 50 percent of the CHP capacity (MW) in the United States from 2001 through 2005 (Figure 2). From 2003 through 2005, 75 percent of national CHP capacity is attributable to CHP Partners!

Figure 1: Total Number of New Installations Added per Year

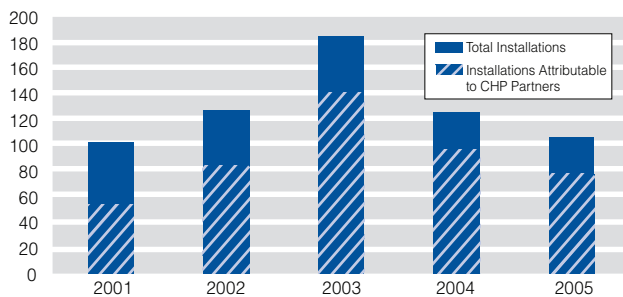
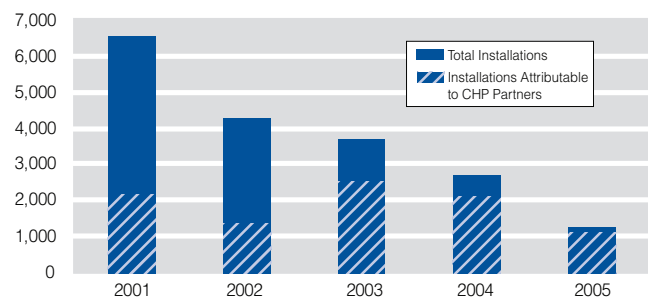


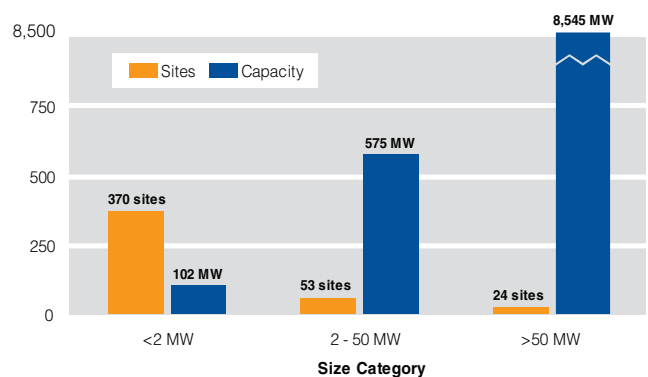
Figure 2: Total New Capacity of CHP Projects Added per Year



System Sizes

Of all CHP projects reported by Partners as operational between 2001 and 2005, 83 percent have been small (less than 2 MW in size; Figure 3). These smaller projects account for only 1 percent of installed capacity, while 93 percent of installed capacity is attributable to the 24 largest reported projects (greater than 50 MW; Figure 3). Of all CHP projects reported by Partners as operational between 2001 and 2005, 83 percent have been small (less than 2 MW in size; Figure 3). These smaller projects account for only 1 percent of installed capacity, while 93 percent of installed capacity is attributable to the 24 largest reported projects (greater than 50 MW; Figure 3).

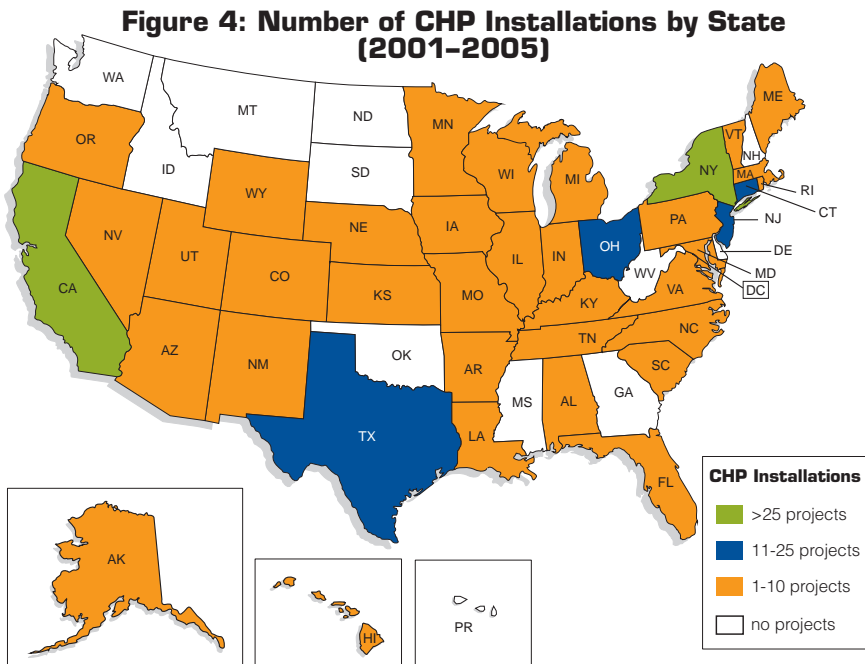
Figure 3: Total Installed Projects by Size Category (2001–2005)



Partner Accomplishments

Geographic Distribution

Based on Partner-reported CHP data, CHP systems are currently operating in 39 states. The highest concentrations of installed CHP systems are in California, Ohio, Texas, and the northeastern states (Figure 4).



Fuel Use

Of the five most commonly installed prime movers used in CHP systems, 87 percent are fueled with natural gas, while 13 percent are fueled with biomass (Figure 5). With less commonly installed prime movers, there is more variety in the fuel type used to power the system (Figure 5). Of all operational CHP projects reported by Partners, 97 percent of CHP capacity is fueled by natural gas with the remaining 3 percent fueled by biomass and coal (Figure 6). For projects reported as in development, at least 15 percent are projected to be fueled with biomass; however, natural gas will still remain the predominant fuel type for CHP systems.

Figure 5: Total Number of Installations by Fuel and Prime Mover (2001–2005)

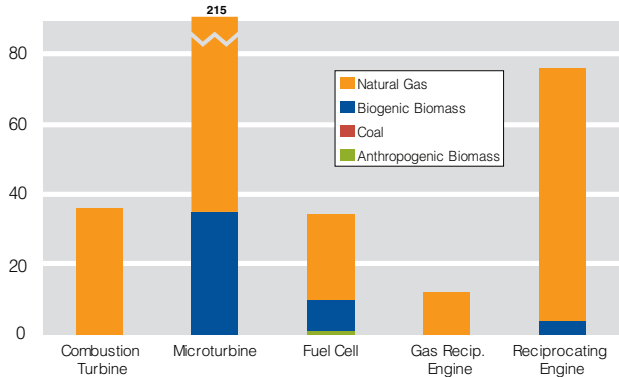
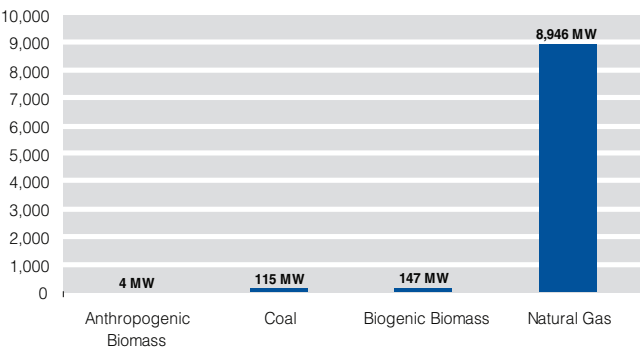


Figure 6: Total Installed Capacity by Fuel Type (2001–2005)



	Boiler	Condensing Turbine	Backpressure Turbine	Multiple Prime Movers
Natural Gas			1	7
Biogenic Biomass	1		2	1
Coal			3	
Anthropogenic Biomass		1	1	

Partner Accomplishments

Future Development

Based on Partner-reported data through 2005, Partners expect to install almost 3,000 MW of new capacity from 2006 to 2010 (Figure 7). CHP Partners have reported a total of 385 projects in development (e.g., in construction, in engineering, or proposed) for 2006 through 2010. Based on these data, a significant concentration of new installations are expected to be installed in states that actively promote the development of CHP as a means to support their clean energy goals, such as California, Texas, New Jersey, and New York (Figure 8).

Figure 7: Projected Growth in Number of CHP Installations by State (2006-2010)

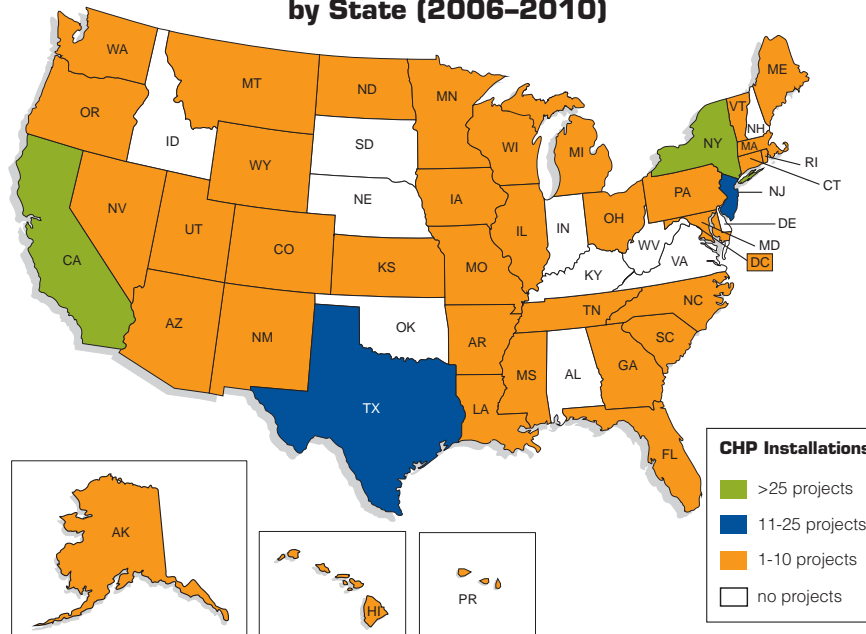
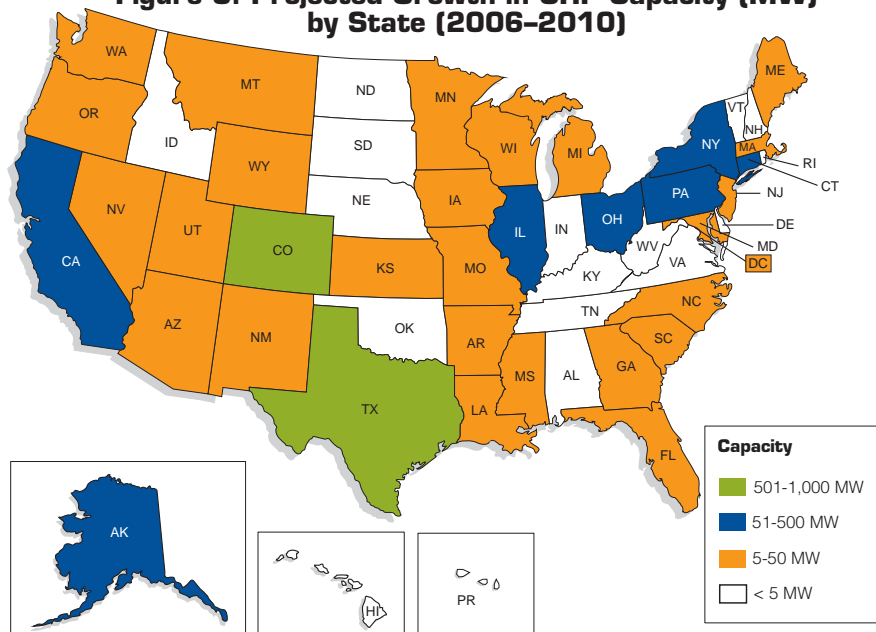


Figure 8: Projected Growth in CHP Capacity (MW) by State (2006-2010)



Partner Focus

CHP Equipment Manufacturers Stay Ahead of the Curve in Emissions Performance

In keeping with nationwide trends towards stricter air emissions requirements, CHP equipment manufacturers, many of which are EPA CHP Partners, are making CHP an even more environmentally friendly option for supplying reliable onsite electricity and thermal energy.

On January 1, 2007, the California Air Resources Board's (CARB) most stringent air quality emissions requirements for distributed generation will go into effect. These standards decrease allowable nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compound (VOC) emissions by more than a factor of 10 below 2003 standards (from 0.7 lbs/MWh to 0.07 lbs/MWh for NO_x; from 6.0 lbs/MWh to 0.1 lbs/MWh for CO; and from 1.0 lbs/MWh to 0.02 lbs/MWh for VOCs).

In addition, in March 2005, EPA issued the Clean Air Interstate Rule (CAIR), a rule that will achieve the largest reduction in air pollution in more than a decade. CAIR will permanently cap emissions of sulfur dioxide (SO₂) and NO_x across 28 eastern states and the District of Columbia. When fully implemented, CAIR will reduce SO₂ emissions in these states by over 70 percent and NO_x emissions by over 60 percent from 2003 levels. States are required to submit their implementation plans to EPA in September 2006 and are likely to require stricter limits on air emissions from a variety of sources, including facilities inclined to install distributed generation (DG) in the process of meeting their CAIR requirements.

In anticipation of continuing limits on air emissions, multiple equipment manufacturers have recently been producing CHP equipment to help energy users meet the nation's most stringent air quality emissions requirements. These advances should further enhance the emissions benefits gained through the use of CHP in place of separate heat and power and also help streamline the permitting process for CHP projects.

In 2005, equipment manufactured by two CHP Partners—FuelCell Energy and Ingersoll-Rand Energy Systems—became state-certified to meet CARB's stringent new DG emissions standards for 2007.* Another Partner—Solar Turbines—began shipping its first full production model of a guaranteed low-emissions-profile turbine.

**The CARB 2007 emissions standards classify electric generation technologies as "ultra-clean and low-emission distributed generation" if they produce zero emissions during their operation or produce emissions equal to or less than levels established by the CARB. The CARB 2007 emissions standards are 0.07 lb/MWh NO_x, 0.10 lb/MWh CO, and 0.02 lb/MWh VOCs, with a credit of one lb/MWh for each 3.4 million Btu of heat recovered. To meet the new CARB 2007 emission standards, natural gas-fueled DG technologies (such as fuel cells, reciprocating engine-driven generators, and microturbines) must successfully pass a set of emissions limits comparable to the Best Available Control Technology (BACT) standards used in larger and more advanced central power plants. After January 1, 2007, only DG technologies that successfully meet the CARB 2007 emissions standards may be sold in California in areas where site permits are not required.*



Photo courtesy of FuelCell Energy

Sierra Nevada Brewery, Chico, California. The 1-MW installation consists of four 250 kW Direct FuelCell® power plants from FuelCell Energy, which are classified as an Ultra-Clean technology under California law.

In November 2005, Ingersoll-Rand's 250 kW microturbine system became the first and, to date, the only microturbine to be certified under the CARB 2007 emissions standards. In December 2005, FuelCell Energy's modular 250 kW Direct FuelCell® power plant also received CARB 2007 certification, making it the third FuelCell Energy product to qualify under CARB's standards. The company's 250 kW DFC300A power plant was certified under CARB 2007 standards in May 2003, and its 1 MW class DFC1500 power plant was certified under the standard in September 2004.

In the larger class size, the Mercury 50, manufactured by Solar Turbines, is a 4.6 MW recuperated gas turbine that began commercial production this year. The Mercury 50 turbine was initially developed under DOE's Advanced Turbine Systems (ATS) program, which ran from 1992 to 2000. The ATS program set out to create a product smaller than 20 MW with NO_x emissions lower than 8 ppm and with a 15 percent improvement in thermal efficiency over conventional gas turbines, all while maintaining a high level of reliability, availability, maintainability, and durability. Using Solar's ultra lean premix combustion system, the Mercury 50 is guaranteed to emit less than 5 ppm NO_x, 10 ppm CO, and 10 ppm unburned hydrocarbons without using supplemental emission reduction equipment or urea.

Photo courtesy of University of Cincinnati



University of Cincinnati central plant, Cincinnati, Ohio

University of Cincinnati Continues 10 Years of Energy Leadership with Its CHP Central Plant

As part of its 10-year effort to reduce energy consumption, increase reliability, and create an environmentally friendly operation, the University of Cincinnati installed a 46 MW CHP system at its central plant in 2004. University energy managers also considered other options, such as installing independent boilers while purchasing all of its electricity from the local utility, which uses primarily coal-fired generation. Although the initial investment in CHP was more expensive, the university selected the CHP plant because it would prove more cost-effective in the long run (i.e., over a 20-year time period), was more environmentally friendly, and would provide greater reliability than conventional separate heat and power.

The CHP plant is designed to operate independently of the electric grid, which enables the university to maintain power for its 33,000 students, research laboratories, facilities, and hospitals in the event of a disaster or utility failure. The university is the largest employer in Cincinnati and the provider of energy to six hospitals; therefore, the reliability provided by the new CHP system is critical. The university even took the unprecedented step of simulating a large-scale blackout by completely disconnecting from the utility grid and starting its entire CHP system one breaker at a time, as a test of its ability. “Folks were

extremely skeptical about testing the CHP system in simulated blackout conditions, because if anything went wrong, we could have been in big trouble,” said Joe Harrel, Director of Utility Operations. “However, I was confident enough in the system that we went ahead, and within just an hour-and-a-half, the entire campus was up and running again.”

The university’s CHP plant operates at approximately 70 percent efficiency and uses approximately 22 percent less fuel than equivalent separate heat and power. Using the continuous emission monitoring data the university provided, 2000 EGRID emission data for the state of Ohio, and estimated emissions from a displaced coal-fired boiler, the Partnership calculates that the University’s 46 MW CHP system reduces annual CO₂ and NO_x emissions by 56 percent and 86 percent, respectively, from a business-as-usual scenario. These CO₂ savings are equivalent to removing the emissions of over 13,000 cars from the road each year.

“The CHP Certificate of Recognition from EPA was one of the best awards we could have received—it really reinforced our conviction that we’d done the right thing by opting for this extremely clean technology rather than the alternatives.”

Everett Wolverton

Associate Vice President of
Administrative and Business Services

In October 2005, the Partnership recognized the considerable pollution reduction and energy efficiency qualities of this project by presenting the university with a 2005 CHP Certificate of Recognition.

For more information on the CHP plant or other energy-saving measures in place at the university, please contact Joe Harrell, Director of Utility Operations, University of Cincinnati, at harrelljh@ucmail.uc.edu.

Partner Focus

New Jersey Clean Energy CHP Program Announces Second Round of Funding Awards

The New Jersey Clean Energy Program (NJ CEP) recently announced its selection of 10 new CHP projects that will receive funding under its 2005 CHP incentive program. Following evaluation of the 26 projects submitted for consideration, NJ CEP awarded a total of \$7,443,370 to the 10 selected projects. These newly funded projects are expected to contribute 18 MW of capacity to New Jersey's clean DG portfolio and to spur the growth of CHP markets and technologies throughout the state.

The mission of the NJ CEP, which is administered by the New Jersey Board of Public Utilities (BPU), is to use energy efficiency and clean DG to provide reliable, environmentally beneficial energy solutions for New Jersey. Members of the CHP Program development team established the following key goals for the CHP Program, as a viable component of a strategic energy savings plan:

- Increase energy efficiency
- Reduce overall system peak demand
- Encourage the use of emerging technologies

The development of the CHP Program was the result of a positive, collaborative effort involving a host of nontraditional allies. With the support and guidance of Michael Winka, Director of BPU's Office of Clean Energy (OCE), and Mona Mosser, Chief of OCE's Bureau of Energy Efficiency, the program received regulatory approval in 2005. The program's operational initiatives were led by Ms. Mosser and Bruce Grossman of South Jersey Gas, with significant effort and participation from the New Jersey Department of Environmental Protection, Rutgers University, New Jersey Natural Gas, Elizabethtown Gas, Public

"We created this new initiative to help reduce greenhouse gases, create jobs, and reduce stress on the power grid."

Mike Winka

Director of NJ BPU Office of Clean Energy

Service Electric and Gas, and the EPA CHP Partnership. Bruce Grossman, Manager of Energy Programs at South Jersey Gas, commented on the team and its efforts, stating, "We got results within one year through working with a national agency, two state agencies, a public university, and four utilities. This was a dedicated team!"

By involving a broad diversity of organizations in the CHP Program's development, NJ CEP enabled stakeholders to address cross-functional barriers to CHP deployment, ensuring the development of a solid system of incentives for encouraging customers to move forward with CHP. Over the course of one year, the multi-faceted team designed, created, and implemented a CHP program complete with two rounds of funding solicitations (in June 2004 and June 2005).

The CHP Program gives qualifying customers, contractors, and energy service companies incentives to purchase and install various types of CHP units. To qualify, a customer's facility must be located in New Jersey, purchase electricity from the utility grid, and be an electric or gas customer on an eligible tariff. Incentives are paid out up to 1 MW of capacity at different \$/watt levels, depending on the technology used.

For more information about the program and the 2006 solicitation, which will be open from April 17, 2006 through June 30, 2006, see www.njcleanenergy.com/html/Combined/combined.html.

New Connecticut Energy Legislation Aims to Increase CHP

In June 2005, the Connecticut legislature passed the “Act Concerning Energy Independence” (HB-7501), which contains numerous provisions to increase DG (including CHP) and energy efficiency. A key goal of this omnibus state energy package is to reduce the hundreds of millions of dollars in new federally mandated congestion charges (FMCC) that Connecticut ratepayers are facing, particularly in the southwestern portion of the state. Provisions of the energy legislation that represent positive developments for CHP are highlighted below.

- **A new efficiency and CHP portfolio standard** requires standard offer and competitive electric suppliers to obtain mandated percentages of their output from Class III resources. Suppliers must obtain 1 percent by January 1, 2007, and an additional 1 percent every year thereafter, up to 4 percent by January 1, 2010.

“Building new transmission lines alone isn’t going to solve the problem.”

Chris James, Director

Air Planning, Connecticut Department of Environmental Protection

- **Class III resources** include CHP generation and energy conservation services. CHP qualifies if it has an operating efficiency no less than 50 percent, is sited at a commercial or industrial end-user’s facility, and is developed on or after January 1, 2006. Alternately, electricity savings created at commercial or industrial facilities from conservation and load management programs also qualify as a Class III resource.
- **Customer-sited distributed resources that use natural gas** will be eligible for a rebate of gas delivery charges from the electric distribution company.
- **Customer-sited distributed resources are exempt from back-up power rates**, provided that the resource is available during system peak periods and the system capacity is less than the customer’s maximum metered peak load.

- **Customer-sited distributed resources** include (a) generation of electricity from a unit with a rating of not more than 65 MW on the premise of a retail end-user within the transmission and distribution system or (b) a reduction in the demand for electricity on the premises of a retail end-user in the distribution system through methods of conservation and load management, including, but not limited to, peak reduction systems and demand response systems.
- **Long-term financing will be available for customer-sited DG and advanced monitoring and metering equipment** purchased or leased by customers of electric distribution companies. The Connecticut Department of Public Utility Control (CT DPUC) has not yet designated the entity that will be responsible for implementing financing. Preference for financing will be given to projects and metering equipment that reduce FMCC.
- **Utilities may receive a one-time, non-recurring award (i.e., a “capacity grant”)** of \$200/kW in 2008, declining by \$50/year through 2011, to educate, assist, and promote investments in customer-sited DG that reduce FMCC.

The CT DPUC will continue to work on finalizing the details of many of these provisions through early 2006. To view the status and content of the CT DPUC’s decisions, visit www.state.ct.us/dpuc and search the active docket database for dockets 05-07-14 through 05-07-21.

For the full text of the bill, visit www.cga.ct.gov/2005/TOB/h/pdf/2005HB-07501-R00-HB.pdf.

Beginning in 2006, the CHP Partnership will provide one-on-one assistance to states interested in policies that significantly impact CHP, including interconnection standards, standby rates, and CHP as an eligible RPS resource. If you have state policy interests, please contact Katrina Pielli to discuss.

Policy Highlights

Pennsylvania Alternative Energy Portfolio Standard Includes CHP

Pennsylvania's new Alternative Energy Portfolio Standard (AEPS) requires that 18 percent of Pennsylvania's energy resources come from alternative sources by 2020. The first 10 percent must come from Tier II resources, which include waste coal, DG systems (including CHP), demand-side management, large-scale hydropower, municipal solid waste, byproducts of wood-pulping and manufacturing, integrated combined coal-gasification technology, and energy efficiency. The other 8 percent must be derived from Tier I resources, which include wind, photovoltaics, solar thermal, low-impact hydropower, geothermal, biomass, fuel cells, coal bed methane, and biological methane. **Depending on the fuel used, CHP could qualify under either tier of the AEPS requirements.**

The AEPS took effect on February 28, 2005 and applies to both electric distribution companies and electric generation suppliers. During the first compliance year (June 1, 2006 through May 31, 2007), 5.7 percent of the total fuel mix sold by utilities and retail marketers in Pennsylvania must be derived from alternative sources, as defined in the AEPS. The law establishes alternative compliance payments of \$45 per alternative energy credit for non-compliance. An alternative energy credit is 1 megawatt hour (MWh) of alternative energy generated or 1 MWh conserved from demand-side management or energy efficiency.

The Public Utility Commission (PUC) designated demand side management and energy efficiency standards in September 2005. The standards include:

- A catalog approach for standard energy savings measures that are readily available (e.g., energy-efficient appliances, light bulbs, heating and air-conditioning equipment).
- Custom or metered measures for DG or atypical systems. Metered measures will apply to DG (including CHP) where the value of generator output can be directly measured.

In addition to requirements for utilities, the Act provides for *interconnection and net metering of DG resources up to 50 kW for residents and 1 MW (or up to 2 MW under certain conditions)* for others. The PUC has outlined universal review procedures for the electric distribution companies to follow in evaluating potentially interconnected systems. Net metering will be credited throughout the year in which it occurred at the full retail rate for the billing period; at the end of the year, net metering payments will be made at the utility's avoided cost. A net metering customer owns the alternative energy credits of the electricity it generates unless the contract specifies otherwise.

The AEPS provides an opportunity for an additional income stream for CHP projects in Pennsylvania. The development of interconnection and net metering standards should further facilitate project implementation through reduced uncertainty around timelines, fees, and technical requirements.

For more information on the PA AEPS and its implementation, please see www.puc.state.pa.us/electric/electric_aeps_working_groups.aspx.

Alternative Language for Clean Air Interstate Rule Provides Improved Treatment for CHP



In August 2005, the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO) released the publication *Alternative NO_x Allowance Allocation Language for the Clean Air Interstate Rule*. This document provides suggested language for helping states meet Clean Air Interstate Rule requirements while

encouraging the use of clean technologies by promoting CHP, end-use efficiency, renewables, or lower-emitting technologies.

The Clean Air Interstate Rule requires states in the eastern United States to revise their state implementation plans (SIPs) to address continuing nonattainment of the ozone and PM_{2.5} ambient air standards. If states choose to achieve SO₂ and/or NO_x reductions through regional emission cap and trade programs, they must adopt rules to regulate their emission trading programs. While EPA does provide states with model allocation language for NO_x, states have broad flexibility to design their NO_x allocation systems, leaving the door open to improved treatment of CHP and other clean technologies.

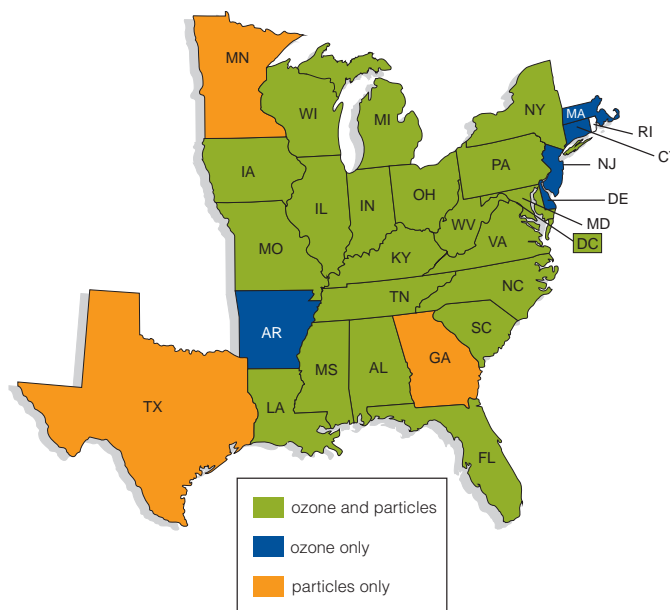
STAPPA/ALAPCO's document provides options for designing the NO_x allocation system, including:

- Output-based allocation
- Improved treatment of CHP
- Fuel-neutral allocation
- Updating the allocation baseline each time allowances are reallocated
- Reduced allocation lead time to bring new units in faster
- Increased new source set-aside
- Energy efficiency/renewable set-aside
- Direct allocation to renewables/energy efficiency
- Reduction of NO_x cap

Specific regulatory language that states can adopt directly or use as the basis for state-specific alternatives is provided in the attachments of the *Alternative NO_x Allowance Allocation Language for the Clean Air Interstate Rule*, found at www.4cleanair.org/PublicationDetails.asp.

To learn more about the Partnership's work on output-based emissions standards, contact Tom Frankiewicz.

Clean Air Interstate Rule States



Tools You Can Use

Funding and Regulatory/Rates Database

As an expanded service to our Partners, the CHP Partnership Web site now provides a regularly updated list of CHP and biomass/biogas funding opportunities, along with utility rates and environmental regulations that are beneficial for project development. This feature of the Web site includes:

- State and federal CHP incentives
- State and federal biomass/biogas incentives
- Utility, state utility commission, and state environmental agency rules and regulations that remove unintended barriers to clean DG projects

The Partnership updates this information twice a month on the **Partner Resources** section of the Web site: www.epa.gov/chp/funding_opps.htm. You may want to bookmark the site!

CHP Project Development Process Tools

The Partnership has created a new tool to help energy users become CHP champions by understanding, navigating and streamlining CHP project development at their facility. The CHP project development process section of the website provides an introduction (e.g., purposes, outcomes, goals, effort, and costs) to the phases of project development and includes tools and resources to help energy users collect the information they need to make educated decisions.

- The *Level 1 Data Tool* helps energy users collect information they will need to conduct or have someone perform a Level 1 (i.e., screening-level) feasibility analysis at their site. It helps users collect information about facility operations, existing utility bills and costs, and critical electric and thermal energy requirements and load profiles.
- The *Level 2 Feasibility Study Overview and Checklist* provides an introduction to the elements of a Level 2 CHP feasibility study—an engineering study using verified data to determine optimal system design and pricing. It includes a checklist for energy users who are considering implementing CHP at their facilities. The tool helps users:
 - Develop the scope for the procurement of a Level 2 feasibility study
 - Review the results of a Level 2 feasibility study for completeness

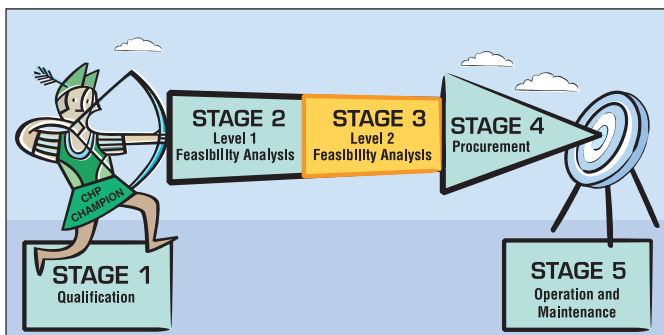
These tools and others are available in the **CHP Project Resources** page of the Partnership Web site at www.epa.gov/chp/project_resources/proj_dev_process.htm.

CHP Emissions Calculator

The CHP Emissions Calculator is a tool that compares the anticipated emissions from a CHP system to the emissions from systems using separate heat and power generation. A user can select from a large number of different separate heat and power system profiles, compare them to a CHP system, and estimate the NO_x, SO₂, and CO₂ emission reductions achieved by the CHP system. In developing the calculator, the CHP Partnership hopes to help CHP end-users and other interested parties calculate the emissions attributable to their CHP projects. The Emissions Calculator (and corresponding user manual) will be available in early 2006 on the **CHP Project Resources** section of the Web site at www.epa.gov/chp/project_resources.htm.

Clean Energy Environment Guide to Action Fact Sheets

The Partnership has developed five new fact sheets about policies and programs that state policymakers can use to support clean energy, including CHP and clean DG. These new fact sheets include *Renewable Portfolio Standards*, *State Clean Energy Funds*, *Interconnection Standards*, *Utility Rates*, and *Output-based Regulations*. They will serve as companions to full chapters of EPA's forthcoming *Clean Energy-Environment Guide to Action*, to be released on February 6, 2006. Each fact sheet includes brief discussions of the benefits, key features, and suggestions for successful approaches for each policy, along with state examples and resources for more information. These may be useful as you speak to your state policymakers about the benefits of increasing CHP in your state. They can be found on the **State Resources** page of the Web site at www.epa.gov/chp/state_resources.htm.



The CHP Project Development Process

Our Newest Partners

The CHP Partnership extends a warm welcome to the following 33 Partners who joined in 2005. To learn more about these and all our Partners, visit the Our Partners page of our Web site at: www.epa.gov/chp/chp_partners.htm.

Alliant Energy Generation

AmericanDG Energy, Inc.

Arizona State University

Benz Air Engineering Company

Burns & Roe Enterprises, Inc.

Chevron Energy Solutions

City of Palo Alto Utilities

CMC-Engineering

**Connecticut Natural Gas
Corporation/Southern Connecticut Gas**

Cornell University

Distributed Generation Solutions

Electrotechnology Applications Center

EME, LLC

Harvest Energy Ltd.

Intrinergy, LLC

Johnson & Johnson

LightRidge Resources, LLC

MECS, Inc.

New York Presbyterian Hospital

Northwind Phoenix, LLC

Pan American Power Solutions

PowerHouse Energy

PPL SavageALERT, Inc.

RDA Engineering

Renova Energy, Inc.

**Sacramento Municipal Utility District
(SMUD)**

Shafer, Kline & Warren, Inc.

Southwest Suburban Sewer District

Tecogen, Inc.

University of Cincinnati

UTC Power

Waldron Engineering & Construction, Inc.

WaterSmart Environmental, Inc.



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